

Amino acid

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In chemistry, an **amino acid** is any molecule that contains both amino and carboxylic acid functional groups. In biochemistry, this shorter and more general term is frequently used to refer to alpha amino acids: those amino acids in which the amino and carboxylate functionalities are attached to the same carbon.

Amino acid residue is what is left of an amino acid once a water molecule has been lost (an H+ from the nitrogenous side and an OH- from the carboxylic side) in the formation of a peptide bond.

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Overview

Amino acids are biochemical building blocks. They form short polymer chains called polypeptides or peptides which in turn form structures called proteins (see below).

Twenty amino acids are encoded by the standard genetic code and are called proteinogenic. Rarer, more complicated ones are "made to order" by the body. Proline is the only proteinogenic amino acid whose side group is cyclic and links to the α -amino group, forming a secondary amino group. Strictly speaking, this makes proline an imino acid. Other amino acids contained in proteins are usually formed by modification after translation (protein synthesis). These modifications are often essential for the function of the protein. At least two amino acids other than the standard 20 are sometimes incorporated into proteins during translation:

- Selenocysteine is incorporated into some proteins at a UGA codon, which is normally a stop codon.
- Pyrrolysine is used by some methanogens in enzymes that they use to produce methane. It is coded for similarly to selenocysteine but with the codon UAG instead.

Over 500 amino acids have been found in nature. Some of them have also been found in meteoritic material. Microorganisms and plants often produce very uncommon amino acids, which can be found in peptidic antibiotics (for example nisin or alamethicin). Lanthionine is a sulfide bridged alanine dimer which is found together with unsaturated amino acids in antibiotics (antibiotic peptides from microbial origin). 1-Aminocyclopropane-1-carboxylic acid (ACC) is a small disubstituted cyclic amino acid and a key intermediate in the production of the plant hormone ethylene.

In addition to amino acids for protein synthesis, there are other biologically important amino acids, such as the neurotransmitters glycine, GABA and glutamate, as well as carnitine (used in lipid transport within a cell), ornithine, citrulline, homocysteine, hydroxyproline, hydroxylysine, and sarcosine.

Some of the 20 amino acids in the genetic code are called essential amino acids, because they cannot be synthesized by the body from other compounds through chemical reactions, but instead must be taken in with food. In humans, the essential amino acids are lysine, leucine, isoleucine, methionine, phenylalanine, threonine, tryptophan, valine, and (in children) histidine and arginine.

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